

Bonn. zool. Beitr.	Jg. 36	H. 3/4	S. 585—606	Bonn, Oktober 1985
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Conservation status of reptiles in the Canary Islands

by

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Introduction

On the occasion of the symposium „Herpetologia Canariensis”, organized by the Museum Alexander Koenig (Bonn), November 1—3, 1984, we considered it appropriate to present an actual vision of the conservation status of the Canarian herpetofauna. We also feel compelled to do it because of the recent proliferation of endangered species lists and red data books, completed by international organizations (IUCN, Council of Europe, etc). In various cases, these works only compile information previously extant in publications, which are usually not specific on conservation. This gives base to a distorted view of the true status of the species in nature.

In this context, we present an analysis of the conservation status of the Canarian reptiles (marine species excluded) based on our direct field knowledge and gathered throughout several years of work in all islands. Moreover, we do not have any reference of publications that treat this matter in detail. That of Baez & al. (1984), despite the title, only refers to distribution of species and their natural enemies, and does not discuss specific conservational aspects.

Studies on Canarian reptiles

The literature on Canarian reptiles is rich relative to the variety of the fauna and, in particular, to its high endemic level. Thus, many publications attend to descriptions of new taxa, biogeography and the very interesting island evolutionary aspects. There are also general synthetical works like those of Salvador (1984), Klemmer (1976) or Baez (1984). Nevertheless, and as could be stated by the papers presented in the Herpetologia Canariensis Symposium, in recent years a revival of Canarian reptile studies has taken place. This may be due to the development of new fields of study (ethology, captive breeding, reproduction, physiology, etc) or the emergence of modern and more sophisticated techniques (cytogenetic, biochemical) applied to classical theses. Field work has become more specialized and even limited populations on small islets and offshore rocks are being studied (Joger & Bischoff 1983, Martín 1985, Bischoff 1985, etc). Another important branch of study, that will probably grow quickly in the immediate future, is that of fossil species systematics and past distribution.

In this paper we have included a bibliography of Canarian herpetology, convinced that it gives a better idea of what has been achieved and that it will be of help to anyone interested in Canarian reptiles.

Threatened categories

The geographic area examined in this work is the Canary Islands. This signifies that the assigned conservation categories apply only to Canarian populations. Since the majority of cases refer to endemics, these categories are valid at a taxa status. The only exceptions are: *Hemidactylus turcicus*, an alien recently introduced, *Chalcides viridanus* and *Chalcides sexlineatus* which also inhabit Madeira, but were probably introduced by man (Pasteur, 1981 p. 7).

The universally accepted threatened categories of IUCN (vide Honegger 1978; Blas Aritio 1976; Groombridge 1982) are used, but slightly adapted to an archipelago scale. The time gap for trend evaluation is approximately 15 years.

Endangered (E): Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included are taxa whose numbers have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction. (We will differentiate, as Ex taxa or populations that are possibly already extinct).

Vulnerable (V): Taxa believed likely to move into the endangered category in the near future if the causal factors continue operating. Included are taxa of which most, or all, the populations are decreasing due to over-exploitation, extensive destruction of habitat or other environmental disturbance; taxa with populations that have been seriously depleted and whose ultimate security is not yet assured; and taxa with populations that are still abundant but are under threat from serious adverse factors throughout their range.

Rare (R): Taxa with small world (Canarian) populations that are not at present endangered or vulnerable but are at risk. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range.

Indeterminate (I): Taxa known to be "endangered", "vulnerable" or "rare" but where there is not enough information to say which of the three categories is appropriate.

Insufficiently known (K): Taxa that are suspected but not definitely known to belong to any of the above categories, because of lack of information.

Not threatened (nt).

Status of reptiles in the Canary Islands

On table I a general list of Canarian reptiles is given and their threatened category symbols are shown for each island, islet or rock, if present.

Gallotia aff. *simonyi*¹⁾ is the only taxon considered endangered. The population on Hierro is restricted to a stock of one hundred specimens living in extreme conditions on a ridge of a cliff face. For a detailed account see Machado (1985).

1) Blas Aritio (1976 p. 50) considers Gran Canarian (!) and Hierro Giant lizards in need of special protection. IUCN Red Data Book (1978) and Council of Europe's threatened amphibians and reptiles list (Honegger 1978: 79) includes only the latter under "endangered" status.



Fig. 1. The "Roque Chico" of Salmor (El Hierro), type locality of the now extinct *Gallotia simonyi*. Photo A. Machado.

The Lizard of Salmor, *G. simonyi* (Steind.), is extinct as confirmed during August 1984. A further record of *G. simonyi* on the Roque de Fuera (Anaga, Tenerife) given by Báez & Bravo (1983) is probably an error (Martín 1985).

All populations inhabiting small islets or rocks offshore have to be classified as 'rare', because of their small size, but deserve extra consideration when those populations have a special taxonomic status, such as *Gallotia galloti insulana-gae* Martín, 1985 (endemic to the Roque de Fuera). In this particular case, the present day threat is collecting and therefore the taxon was placed under category 'vulnerable'.

Threat analysis

Habitat reduction

Since man arrived in the Canary Islands (not previous to 2000 B.C., Castro Alfin 1983: 83) many changes have taken place in the insular environment, especially with the development of modern civilization. In general terms, one may conclude that a group of large size reptiles have suffered a strong decline if not extinction (Kämmer 1982, Machado 1985).

However, most of the remaining reptilian fauna has gained an important advantage as the available habitat has increased due to deforestation and increased aridity in vast sectors of the islands (vide Machado 1976, Castro Alfin 1983). Other favourable factors include the establishment of fruit monocultures (vineyards, *Opuntia*, tomatoes, bananas, etc) and the extensive building of stone fences and walls (fig. 2).

In general, habitat reduction is not a real problem for Canarian reptiles today. As suggested above, many lizards and geckos adapt successfully to agricultural



Fig. 2. The cultivated areas in the intermediate zones of some islands may represent a habitat expansion for thermophilic reptiles. Photo I. Sánchez.

systems, and they may even increase, as sometimes occurs with other groups of vertebrates (v. habitat expansion in birds, Vølse 1955). Nevertheless, some special cases are worth mentioning.

Hemidactylus established itself in the Barranco de Santos in the surroundings of the municipal market of Santa Cruz (Baez 1979) but it could be threatened if the works of re-development and canalization of the ravine (= barranco) continue.

The Gran Canarian population of *Gallotia atlantica*⁴⁾ is restricted to a small area of 2.5 x 1 km, and it is possible that this area may become urbanized.

The small Roque del Este, 11 km off Lanzarote, was used as a target by Spanish Navy and Airforce (see footnote 2) till the sixties. The Defense Department was made aware that the largest Spanish colony of *Falco eleonora* breeds there. The bombing was subsequently stopped, but there is no guarantee that it will not be resumed.

Killing, trapping and biocides

Country youths amuse themselves by 'fishing' or killing lizards. Catching is done with the help of a long 'balango'⁵⁾ (= *Avena barbata* Pott. ex Link) whose stem-tip is transformed into a lasso noose. In addition, catapults, gummy-guns and modern air-rifles, — illegally — are still used, with lizards and birds being their

4) Barquín & Martín (1982) consider it as possibly introduced. On the other hand, *Gallotia stehlini* has been recently observed in Fuerteventura (Tiscamanita, F. Domínguez, 1984 pers. comm.) associated with cane-bundles brought for use in tomato-fields from Gran Canaria.

5) The same practice is done in Madeira, and called 'balanco' (Sarmiento, A.A., 1984: Vertebrados da Madeira, vol. 1, Funchal., p. 244)

favorite targets. The impact on lizard populations is not very important, but it represents a mischievous behaviour and sets a bad example for young generations.

Lizards may achieve very high densities and cause considerable economic damage to vineyards, tomatoes and, on a lesser scale, to strawberries and market garden plant seedlings. In the past farmers used tobacco to poison lizards (Viera y Clavijo 1886); more recently, after the use of strychnine sulphate was prohibited, farmers turned to killing them with Fosferno (abandoned), Lannate (extensive), and Furadan and Nemacur (starting), which are products commonly used as fungicides or nematocides in the banana plantations.

The biocide is mixed with tomato or ripe bananas and its effect on the reptiles is almost instantaneous because of its very high toxicity⁶. Its effect may easily extend to birds and other animals (including dogs). One of us (López-Jurado) recorded more than 2000 lizards killed during one tomato crop in a plantation of 5–6 hectares in southern Gran Canaria. In the same area he has placed bait (tomato + Lannate) at 15 spots and collected 92 lizards (87 dead) and 1 skink.

Big plastic bags (fertilizer packets) and deep tin-cans (fig. 3) with bait, water, or oil, are hung or fixed on the boundary walls of fields. Lizards fall inside, sometimes in huge quantities. Tello Marquina (1979) collected 50 specimens in a bag, in six hours. Afterwards they are buried or burned (!). When heavy damage occurs⁷ children may be paid for bringing in dead lizards.

These practices, even though not sufficiently controlled, do not threaten any reptilian taxa and may be regarded as a counterbalance of population explosions due to agriculture activity. However, the use of the mentioned biocides has, in many cases, severe adverse consequences on other species, mainly birds (blackbirds, chaff-chaffs, warblers, etc) and their use should be avoided.

The Regional Agriculture Centre (CRIDA XI) did research to find mechanical, biological and nature-compatible methods to control lizard plagues (Tello Marquina, op.c.) but the project was cancelled before any satisfactory results were obtained.

Introduced species

Natural predators of reptiles in the Canary Islands are kestrels (very efficient), buzzard, shrikes, stonecurlews, ravens, choughs, hoopoes (Pérez Padrón, pers. comm.), Barn and Long-eared owls (these latter two mainly on geckos), and shrews. Dogs, cats, rats and, to a lesser scale, hedgehogs also catch reptiles. The

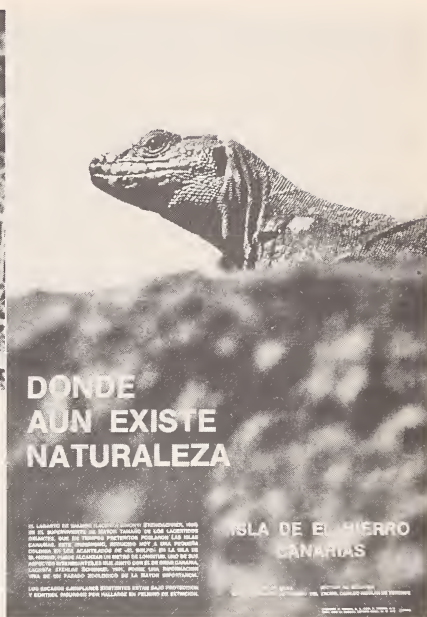
6) Active agents are *Ethylparation* for Fosferno, *Methomyl* for Lannate, *Carbofurane* for Furadan and *Fenamifos* for Nemacur. Letal oral dosis of commercial product for male rats are: 26 mg/Kg, 113–160 mg/Kg, 23–40 mg/Kg and 32–47 mg/Kg respectively (based on data from Worthing, 1979).

7) Economic loss of 30 % of production in tomato, vegetable and ornamental seedlings; 40 % in vineyards in Tenerife (DIARIO DE LAS PALMAS, January 21, 1979: "Lucha contra los lagartos").



Fig. 3. Tin cans used as lizard traps to control populations in cultivated fields. Photo C. Hernández-Rubio.

Fig. 4. Conservation poster (40 x 30 cm), produced by the Union of Insular Councils. Its message means "El Hierro, where there still is Nature". In smaller text information on the status of *Gallotia simonyi* and its importance to science is given.



importance of predation by the latter mentioned species is low on small reptiles but, as postulated by Machado (1985), could have been the reason for the decline of the large lizards. Fortunately, snakes have not been introduced into the archipelago. If this was the case, considerable impact on reptiles by competition and/or predation would be expected. Competition between goats and rabbits with herbivorous reptiles is of importance only at specific sites.

Collecting and trade

The extinction of *Gallotia simonyi* on its only confirmed locality (smaller Roque de Salmor) was due to overcollection, mainly for scientific purposes but also for commercial interest, and occurred in a period of only 42 years. This threat still exists for all species populations living in reduced zones, like islets or rocks offshore, and it is magnified by their taxonomical status. At present many collectors concentrate on endemics or any type of 'singularity' (v. Compte Sart 1977), as keeping reptiles as pets is an increasing hobby in Europe.

Collecting for science or for other reasons is regulated by law, as discussed below, but not everybody applies for a license, and control on remote sites remains difficult.

Trade in Canarian reptiles is nowadays strictly regulated and practically prohibited. The Department of Commerce (and in many cases, foreign authorities) will ask for an ICONA⁸⁾ license, before giving the export/import permit. Some authorized consignments of lizards and frogs were sent from Gran Cana-

ria in 1979, but a strong controversy arose in the public media, and therefore the activity was halted.

Superstition

Townpeople in the Canaries are now much more aware of lizards, in particular, due to the Giant lizard of Hierro, which has become a symbol of conservation (fig. 4). In the country, however, reptiles are just noxious animals ('bichos'), and many women do become very afraid of them, placing poison around their houses.

Geckos still suffer from superstition. Some people believe they can spit or urinate in one's eye causing loss of vision. In northern Gomera (Alonso Herrera, pers. comm.) it is seen as a very dangerous animal. They are considered to like milk and therefore they enter nursing babies' mouths as they sleep, producing asphyxia. Babies are watched and parents may place chewed tobacco at their side to prevent the geckos. When they catch one, they put some tobacco in its mouth, causing a rapid death.

On the contrary, skinks are treated with respect. An elderly person told us (Fuerteventura) that people used to put a living skink inside a piece of cane and keep it hanging around their neck, thinking it was good remedy for coughs and asthma. Sarmiento (1948, p. 239) describes a similar practice from Madeira, using *Lacerta dugesi* M. Edw. On Gomera, the skink was placed alive under the hat and carried along to cure headaches, dandruff and to prevent lice. Mr Florencio Fumero, who was a forest ranger at Vilaflor, Tenerife (died May 1982), did live with a skink permanently in his hat; it should be good for the health.

Legal protection

Spain's first protected animal species list was established by the Decree 2573/1973 of October, 5th. It covered 7 mammals, 44 birds and 3 reptiles (chamaleon and two landturtles). Later, by the Royal Decree 3181/1980 of December, 30th, a much stronger regulation was approved, and the list of strictly protected fauna species greatly increased, following the philosophy of the Convention for the Protection of Wildlife and Natural Habitats (Bern Convention).

In all Spanish territory, the hunting, capture, tenancy, traffic, commerce and exportation of the fauna species listed is prohibited, as is the collecting of eggs or young. The preparation and commerce of stuffed specimens is also prohibited.

In addition, regulations governing collection for scientific, conservation, cultural or educational purposes are given. Under special circumstances, temporary capture or hunting of protected species can be authorized to prevent damage to other species, crops, property, health or public safety. The export of living protected animals or their eggs can be allowed only when reintroduction projects in other countries are involved.

The following reptiles⁹⁾ inhabiting the Canary Islands are protected:

'Salamanquesa costera'	<i>Hemidactylus turcicus</i>
'Salamanquesa común'	<i>Tarentola mauritanica</i>
'Salamanquesa canaria'	<i>Tarentola delalandii</i>
'Lagarto de Haría'	<i>Lacerta atlantica</i>
'Lagarto gigante de Hierro'	<i>Lacerta simonyi</i>
'Lagarto canarión'	<i>Lacerta stehlini</i>
'Lagarto tizón'	<i>Lacerta galloti</i>
'Eslizón canario'	<i>Chalcides viridanus</i>

These are the names that appear in the Royal decree. Spain's authorities probably followed nomenclature established by Salvador (1974) in his field guide (except for *T. delalandii*, which is correctly named as "perinquén"). The list is obviously not consistent with recent nomenclatorial changes and has to be updated. It establishes at least some Spanish official common names for the Canarian reptiles. We do not discuss if they are the most appropriate. On Table II

Table II. Local names of reptiles in the Canary Islands.

barbazul	adult male lizard, Palma
bocinegro	adult male lizard, southern Tenerife
bocín	adult male lizard, southern Tenerife
barbolete	adult male lizard, Palma
cacharón	adult male lizard, NW Palma
cacheros	adult male lizard, La Gomera
lagartija	skink, Gran Canaria
lagartija de la Virgen	skink, southern Gomera
lagartija	small or striped lizards, Palma, Tenerife
lagartijo	common lizard, Hierro
lagarto	giant lizard, Hierro
lebrancho	big lizard (applied to other animals too)
lisa	skinks, western islands
lisneja	skink, Fuerteventura
mero (merito)	black male Hierro common lizard
paperos	adult male lizard, Palma
papazules	adult male lizard, Palma
pen(r)inqué	geckos, Gran Canaria
perenqué*	geckos, Tenerife, Hierro and eastern islands
pijina	juvenile lizard, southern Tenerife
pracan	geckos, Gomera
rayada	female lizard, central Gomera
rolisa	skink, northern Gomera
salamandra	geckos, Palma
tijita	juvenile lizard, Tenerife and Palma
tizo (tizón)	adult male lizard, northern and SE Tenerife
verdino (verdín)	adult male lizard, Tenerife

* Following Wölfel (1965, p. 661) this term should be considered as an aboriginal word.

8) ICONA is the Instituto Nacional para la Conservación de la Naturaleza, an autonomous body inside the Department for Agriculture, Fisheries and Food, governed by a Director General.

9) All marine turtles found in Canarian waters are listed, but we are not considering the sea environment in this paper. For further information on turtles, see Brito Hernández (1982) or López Jurado et al. (1983).

a list of local names compiled by us is given. It shows a great variety and lack of uniformity in denominations.

The Bern convention was signed by the Spanish State (19 Sep. 1979) but has not yet been ratified (Aug. 1985). Regarding land reptiles, *Lacerta simonyi* is included in Appendix II of strictly protected species (no exploitation). Under Appendix III (protected fauna species) all reptiles not included in Appendix II are considered. This last category implies that legislative and administrative measures shall be taken to ensure the protection of these wild species, by regulating any type of exploitation.

The Royal decree which stays in force, is related to the Hunting law of 1970, whose orientation is more towards the hunting activity than to protection of wild species. A General law for conservation of nature is being prepared at present. In this context, an international instrument like the Bern convention, becoming domestic law when ratified, would be of great value.

Apart from Spanish law, there is again a special case with *Gallotia simonyi*, which has been listed as an endangered species by the United States Fish and Wildlife Service (Federal register on February 29, 1984) under the provisions of the Endangered species act of 1973. This declares it illegal for any person subject to the jurisdiction of the United States to take, import or export, possess, carry or conduct any commerce with that lizard.

None of the Canarian reptiles are included in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (C.I.T.E.S.).

Habitat protection overview

The Canary Islands have a high number of protected areas, in accordance with the richness and singularity of its biota. We consider it of interest to give a broad view of these areas (see fig. 6) and the protection of habitat for reptiles.

TEIDE NATIONAL PARK: Established by decree in 1954 and reestablished by law in 1981; volcanic region (fig. 5) with high mountain shrub vegetation in the middle and upper parts of the island of Tenerife (between 2,000 and 3,717 m altitude). Extension 13,500 hectares; four permanent rangers in the field. *Gallotia galloti eisentrauti* is abundant; few geckos and skinks have been seen.

CALDERA DE TABURIENTE NATIONAL PARK in La Palma, established by decree in 1954 and reestablished by law in 1981. Deep depression ranging from 300 to 2,423 m altitude. Covers 4690 hectares mainly of Canary pine forest. Two permanent rangers in the field. Lizards in general uncommon; geckos scarce.

GARAJONAY NATIONAL PARK: Established by law in 1981. Central forested ("laurisilva") region of Gomera (between 700 and 1,487 m altitude). Extension 3,984 hectares; nine permanent rangers in the field. Some lizards, skinks and geckos in the southern part of the park, locally common.

TIMANFAYA NATIONAL PARK: Established by law in 1974 and reestablished in 1981. Covers 5,107 hectares of historic lava flows on Lanzarote. Two permanent rangers in the field. Lizards restricted to kipukas.

EL CANAL Y LOS TILES MAN AND BIOSPHERE RESERVE: Declared by decree in 1984 in the island of La Palma. Sector of deep ravine between 250 and 1,400 m



Fig. 5. Habitat of *Gallotia galloti eisentrauti*, a common species in Teide National Park. Photo A. Machado.

altitude with 511 hectares of laurisilva and pine forest; property of ICONA; one permanent ranger in the field. Lizards scarce, only in upper parts.

DUNAS DE CORRALEJO E ISLA DE LOBOS NATURAL PARK: Established by decree in 1983. Embraces 2,482 hectares of a dune system and a small volcanic island with xerophytic vegetation. Highest point at 127 m; one permanent ranger in the field. Lizards and geckos common in Lobos, but less common in the dunes at Corralejo.

MASPALOMAS NATURE SITE: Has a provisional protection status due to Royal decree 1741 of June 25, 1982. No permanent ranger in the field. 328 hectares of coastal dunes with palms and *Tamarix* vegetation. Very interesting lizard population; skinks and geckos occasional.

The site where *Gallotia* aff. *simonyi* survives in Hierro falls inside a public forest — under ICONA's tutelage — and access has been prohibited since 1975. Permanent vigilance from outside is maintained. However, a project for the declaration of the whole zone including the Roques de Salmor is under administrative process and ready for public hearing. This future Strict Reserve ("Reserva Integral") will probably join the Biogenetic Reserves Network of the Council of Europe.

Action for the future

The situation of the Canarian reptile fauna is not as dangerous as that of other vertebrate groups, or even plants. Actions will be taken in the immediate future to try to recover Hierro's Giant lizard from its extremely endangered status, and its biotope is in the process of being declared a Strict Nature Reserve. Legislation will be actualized soon, and natural habitat protection is entering the general process of land use planning¹⁰⁾.

10) The Land Use Act, presently under consideration, incorporates "Planes Especiales de Protección y Catalogación de Espacios Naturales" (= Special Plans for the Protection and Catalogueing of Naturales Sites) for all islands except Gran Canaria.

Nevertheless, even being optimistic, there are still some other points that deserve attention.

— Educational material on reptiles' role in nature should be prepared not only for school children, but in particular for people in the country.

— New methods for controlling lizard plagues must be applied, stopping the actual and illegal use of strong biocides.

— Any localized reptile population that is somehow singular, should be studied, delimited and, if necessary, protection of its habitat should be sought.

— A Strict Nature Reserve embracing the non-inhabited rocks and islets north of Lanzarote (Roque del Este, Roque del Infierno, Montaña Clara and Alegranza) should be promoted. The same is valid for both Roques de Anaga, off Tenerife.

— Collection of reptiles in small rocks and islets should be strictly controlled to prevent decimation of vulnerable and rare populations.

— A solution for pet-keepers' interests could be found by regulating some form of farming their product, or taking advantage of special cases (plagues, etc).

Zusammenfassung

In dieser Arbeit wird der Schutzstatus der landlebenden Reptilien der Kanarischen Inseln analysiert, basierend auf den Freilandbefragungen der Verfasser. Zur Beurteilung der Arten werden IUCN Kategorien verwendet. Kritische Arten sowie die Reptilienpopulationen beeinflussenden Faktoren werden erörtert. Letztere beinhalten Habitatveränderungen, das Töten, Abfangen oder Vergiften aus wirtschaftlichen Gründen oder aus Aberglauben, das Sammeln und den Einfluß eingeführter Arten. *Gallotia* aff. *simonyi* ist das einzige als „bedroht“ eingestufte Taxon, allerdings werden die meisten Reptilienpopulationen auf Felsen oder Inselchen als „gefährdet“ angesehen. Bisher vorliegende Studien über kanarische Echsen werden kommentiert, und eine Bibliographie der bisher veröffentlichten Arbeiten wird als Appendix beigefügt. Außerdem werden gesetzliche Bestimmungen, national und international, diskutiert. Soweit es den Schutz der Reptilien betrifft, werden die kanarischen Naturparke und Reservate erwähnt. Aktuelle Schutzprogramme werden kurz erläutert und Vorschläge für zukünftige Aktionen gemacht.

Resumen

En este trabajo se presenta un análisis del estado de conservación de la fauna de reptiles terrestres de las Islas Canarias (España) basado en la experiencia de campo de los autores. Se utilizan las categorías de conservación de la UICN y se discuten las especies críticas y los principales factores de amenaza que afectan a las poblaciones. Entre éstos se tratan las alteraciones del habitat, caza, trampeo y biocidas, especies introducidas, coleccionismo, comercio y supersticiones. El Lagarto gigante de El Hierro (*Gallotia* aff. *simonyi*) es el único taxon que se considera amenazado de extinción, y la mayoría de las poblaciones de reptiles de roques e islotes figuran bajo la categoría de vulnerables o raros. Se comentan en general los estudios existentes sobre reptiles de Canarias y se aporta una bibliografía prácticamente completa sobre Herpetología Canaria. Asimismo se incluye

una lista de nombres locales de los reptiles terrestres y se discuten las disposiciones legales, tanto nacionales como internacionales, que afectan a su conservación. También se expone una panorámica de la protección de habitat para reptiles obtenida en la red canaria de parques y reservas naturales. Por último se comentan sucintamente los programas de conservación actualmente en marcha y se aportan algunas sugerencias para acciones en el futuro.

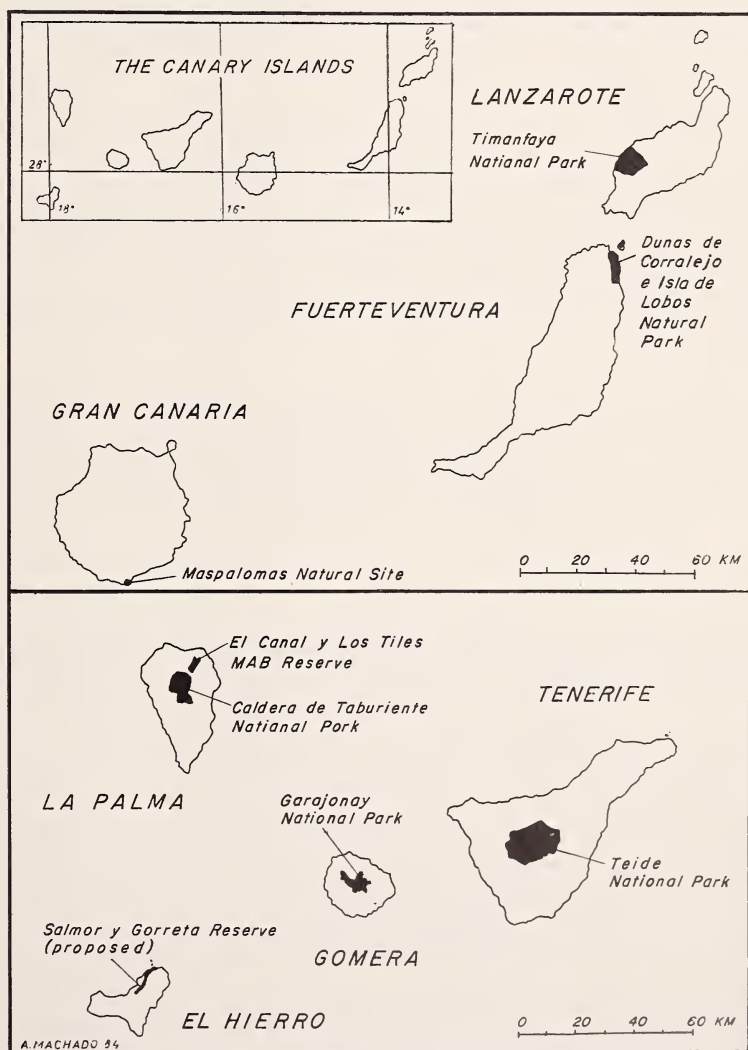


Fig. 6. National Parks and Reserves in the Canary Islands.

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(only non-herpetological, others included in the Appendix)

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Appendix

A bibliography of the reptile and amphibian fauna of the Canary Islands

(compiled with the assistance of J. Díaz de Castro, Las Palmas, and supplemented by the editor).

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Zeitschrift/Journal: [Bonn zoological Bulletin - früher Bonner Zoologische Beiträge.](#)

Jahr/Year: 1985

Band/Volume: [36](#)

Autor(en)/Author(s): Machado Antonio, López-Jurado Luis Felipe, Martín Aurelio

Artikel/Article: [Conservation status of reptiles in the Canary Islands 585-606](#)